

SEP 8 1890

JOURNAL

OF THE

ASIATIC SOCIETY OF BENGAL.



Part II.—NATURAL SCIENCE.

No. III.—1889.

XV.—*Noviciæ Indicæ*. I. *Some additional Species of Pedicularis.*

By D. PRAIN. *Communicated by* DR. G. KING, F. R. S.

[Received Jan. 18th ;—Read Feb. 6th, 1889.]

The account of the genus *Pedicularis*, Linn., in the *Flora of British India*, vol. iv, pp. 306-317, was issued in January 1884 and since then Dr. King's Himalayan collectors have contributed several new forms. The details of a critical examination of the Indian material of this genus preserved at Calcutta, and also of that at Saharanpur, kindly lent for study by Mr. Duthie, are about to appear in another place; meanwhile, diagnoses of the forms new to India, arranged according to the method of the *Flora*, may prove of interest. The numbers of the inner serial list are those of the *Flora*; the references opposite are to descriptions and figures published between 1884 and 1889.

SERIES I. Cauline leaves whorled or opposite.

* *Upper lip beaked.*

1. (1). *P. PECTINATA* Wall.

a. VAR. *typica*; leaves pinnatipartite segments pinnatifid, calyx teeth triangular acute. Wall., Cat. 420; Maxim., Mel. Biol. xii, 810, t. 2, f. 25.

β. VAR. *palans*; leaves pinnatisect segments pinnatipartite, calyx

teeth ovate acuminate. *P. pectinata* Wall. var. *pyramidata* Hook. f., Flor. Brit. Ind. iv, 306 (syn. *P. pyramidata* exclus.). *P. pyramidata* Herb. Ind. or. H. f. & T. T. (nec Royle).

The habit of this species and that of *P. pyramidata* vary equally; apparently intermediate forms prove on dissection to be either *P. pectinata* var. *palans* or *P. pyramidata* with much incised leaves. The geographical limits are distinct in the outer Himalayan ranges and hardly overlap in the inner. There is not at Saharapur or at Calcutta an example of either variety of *P. pectinata* from Kashmir or from Afghanistan, where *P. pyramidata* seems to be the representing form. The diagnosis is as follows:—*P. pectinata*;—beak of corolla gradually tapering to middle then slender, tube sacculate in front at staminal insertion hardly exceeding calyx, lower half of galea erect, stamens inserted opposite top of ovary, filaments densely pilose at insertion as well as above: *P. pyramidata*;—beak of corolla slender from base, tube narrow straight half exceeding calyx, lower part of galea inclined forwards, stamens inserted above middle of tube, filaments glabrous at insertion, slightly hairy above.

2. [1]. *P. PYRAMIDATA* Royle.

Stem tall stout 3-4-fariously hairy, caulino leaves petioled whorled lanceolate pinnatisect or-partite, segments 2-pinnatifid, calyx teeth ovate acuminate entire, corolla tube half exceeding calyx, lip 3-fid obcordate substipitate central lobe small, beak long slender narrowed from base, stamens inserted above middle of tube glabrous at insertion sparingly hirsute above. *P. pyramidata* Royle, Benth. Scroph. Ind., 52; Lindley, Bot. Reg. n. s. xiv, Pl. Misc., 155; Benth., DC. Prodr. x, 565; Maxim., Mel. Biol. xii, 810, t. 2, f. 27.

WESTERN HIMALAYA: Lahul, (Hay! Brandis!); Kashmir, (Royle! Sedgwick!); Gilgit, (Biddulph! Tanner! Giles!); Afghanistan, (Collett! Aitchison!).

Stems 30-80 cm., Spikes 10-30 cm., rootstock stout, leaves 3-4-nately whorled, calyx 10 mm. glabrous or hirsute, corolla purple, tube 13-16 mm. hood inflated rectangularly curved, beak 14 mm. apex entire, ovary ovoid, stigma exserted, capsule 9-11 mm. hardly exserted ovate acuminate, seeds 3-25 mm. pale deeply furrowed and reticulated.

3. (3). *P. TENUIROSTRIS* Benth.; Maxim., Mel. Biol. xii, 811, t. 2, f. 26.

Add to description of F. B. I., iv, 307:—capsule ovate 10 mm. hardly exserted, seeds 3 mm. pale deeply furrowed and reticulated. Fruiting specimens (Duthie 1873!) have now been obtained; the type of this distribution preserved at Saharanpur still retains corollas.

4. (—). *P. OLIVERIANA* Prain.

Tall slender glabrous, leaves 4-nately whorled petioled ovate acute pinnatisect, segments lanceolate pinnatifid, spike interrupted, bracts lanceolate pinnatifid serrate, calyx campanulate, corolla tube slightly exceeding calyx, lip 3-lobed obcordate lateral lobes ovate twice as large as central orbicular, galea angularly curved deflexed beak long flexuous, stamens inserted in middle of tube filaments glabrous. *P. Oliveriana* Prain in Ann. Roy. Bot. Garden, Calcutta, iii ined.

EASTERN HIMALAYA: Phari, (Dr. King's collectors!).

Roots not collected, portions of stem gathered 20-30 cm., calyx 5-6 mm. 5-toothed teeth lanceolate acute serrate equal, corolla purple tube 7 mm. beak 10 mm., ovary ovate acuminate, stigma exserted; capsule not seen.

Repeats habit and foliage of *P. semitorta* Maxim.; diagnosed by the narrow simple bracts, the unclawed calyx and the edentulous throat.

5. (4). *P. GRACILIS* Wall.; Hook. f.

6. (5). *P. PORRECTA* Wall.

7. (6). *P. BREVIFOLIA* Don.

8. (—). *P. INSTAR* Prain.

Glabrescent stems short or tall slender, cauline leaves few paired or whorled distant short ovate oblong or lanceolate pinnatifid pubescent segments crenate, spikes elongated interrupted, bracts foliaceous, calyx campanulate, corolla tube half exceeding calyx, lip 3-partite lobes obovate subequal, galea angularly bent beak narrow slightly decurved tip acute entire, stamens inserted above middle of tube filaments glabrous.

a. VAR. *typica*; stems solitary tall simple strict, radical leaves evanescent petioled cauline 4-nately whorled sessile ovate oblong, beak shorter than lip, capsule broadly ovate $\frac{1}{3}$ exserted. *P. instar* Prain; Maxim., Mel. Biol. xii, 815, t. 2, f. 32.

EASTERN HIMALAYA: Ong-la-thang and Pey-kiong-la, 13,000 feet, (Dr. King's collectors!).

β . VAR. *paradoxa*; stems single or many from base simple or branched dwarf erect or ascending, radical leaves densely tufted cauline opposite or 3-nately (rarely 4-nately) whorled all linear lanceolate petioled, beak as long as lip, capsule lanceolate acute $\frac{1}{2}$ exserted.

EASTERN HIMALAYA: Niapokri and Bijan, 11-12,000 feet, (Dr. King's collectors!).

Stems of type 30-60 cm., of VAR. *paradoxa* 3-8 cm., calyx 4-6 cm. 5-toothed not cleft upper tooth deltoid entire lateral ovate or lanceolate serrate corolla dark red tube 6-8 mm. beak of type 4 mm. of VAR. *paradoxa* 6 mm., filaments inserted midway between top of ovary and mouth of tube, ovary ovate mucronate apex oblique, stigma exserted, capsule of type 8 mm. of VAR. *paradoxa* 10-11 mm., seeds 1.5 mm. pale distinctly reticulated.

VAR. *typica* repeats habit, foliage, calyx and capsule of *P. denudata*, VAR. *paradoxa* those of *P. polygaloides*, two species that differ as widely in appearance as do the two varieties of *P. instar*. In these however a diagnosis may be effected by means of the stamens,—glabrous in *P. polygaloides*, hirsute in *P. denudata*; in *P. instar* VAR. *typica* the filaments are glabrous as they are in VAR. *paradoxa* and the forms are not separable as species.

9. [6]. *P. CONFERTIFLORA* Prain.

Stems dwarf or elongated usually branching from the base pubescent or villous, leaves oblong pinnatisect segments ovate incised serrate radical petioled densely tufted cauline opposite one or more paired subsessile, bracts lacinate segments 3-7 crested at tips, flowers subcapitate or with lowest pair or whorl shortly removed, calyx campanulate, corolla tube twice as long as calyx, lip 3-fid lateral lobes broadly ovate much wider than rounded central, galea angularly curved beak very long narrow slightly decurved apex obtuse entire slightly recurved, stamens inserted in middle of tube filaments glabrous. *P. confertiflora* Prain in Ann. Roy. Bot. Garden, Calcutta, iii ined. *P. brevifolia* Herb. Ind. or. H. f. and T. T. (nec. Don).

EASTERN HIMALAYA: Sikkin, (Hooker!); Chumbi and Phari, (Dr. King's collectors!).

Roots slender stems 6-15 cm. erect simple or many from base central erect the others ascending or decumbent, calyx 6-7 mm. 5-toothed teeth long narrow lanceolate upper entire the rest with entire bases and serrate tips, corolla pink or white tube 11 mm. lateral lobes of lip nearly meeting behind galea, beak 10 mm., ovary ovate apex mucronate, stigma exserted, capsule 10 mm. ovate lanceolate apex oblique $\frac{1}{2}$ exserted, seeds 1.25 mm. ovoid tawny distinctly reticulated.

Capsule and seeds resemble those of *P. instar* and *P. brevifolia*. Differs from both as to calyx and bracts; *P. instar* VAR. *paradoxa* is at once separable by its deeply 3-partite lower lip, *P. brevifolia* by its emarginate apex of beak.

10. (—). *P. HEYDEI* Prain.

Stems villous ascending simple, leaves densely pubescent lanceolate acute pinnatifid segments acute serrate radical long petioled tufted cauline 3-paired lower shortly petioled upper sessile, bracts foliar sessile, flowers few subspicate pedicels almost equalling calyx, calyx oblong villous, corolla tube $\frac{1}{2}$ longer than calyx, lip small sinuately 3-lobed lobes semi-rotund equal margin eroso-crenulate, galea angularly curved beak long falcate apex acute entire, stamens inserted above middle of tube filaments glabrous. *P. Heydei* Prain in Ann. Roy. Bot. Garden, Calcutta, iii ined.

WESTERN HIMALAYA: Lahul, (Watt !); Pangi, (Heyde !).

Roots tufted fusiform fleshy, stems numerous slender, calyx 8 mm. 5-toothed teeth lanceolate subequal upper entire the rest serrate, corolla dark red tube 12-14 mm., beak 8 mm. twice as long as lip, ovary ovate acuminate, stigma exserted, capsule ovate 11 mm. $\frac{1}{2}$ exserted straight acuminate.

The villous habit of this species recalls *P. brevifolia* Don, with which some gatherings of it have been placed. The straight capsule, entire apex of beak, high staminal insertion, long corolla tube, and tufted fleshy roots indicate a closer alliance to *P. porrecta* than to *P. brevifolia*; its lanceolate leaves, however, at once distinguish it, and the calyx is quite different from that of *P. porrecta*, while the very small scarcely lobed lip removes it equally from both.

11. (7). *P. FLEXUOSA* Hook. f.; Maxim., Mel. Biol. xii, 810, t. 2, f. 35.

12. (—). *P. CHUMBICA* Prain.

Dwarf stems simple slender glabrous tufted, leaves ovate oblong obtuse pinnatisect segments ovate serrate-deutate long petioled radical densely caespitose cauline opposito 1-paired or 0, bracts foliar shortly petioled, flowers few subcapitate pedicels short, calyx campanulate shortly cleft, corolla tube thrice as long as calyx, lip 3-sect lobes rotund subequal, galea angularly curved throat 2-sinuate beak long straight slender apex acute entire, stamens inserted below middle of tube filaments glabrous. *P. chumbica* Prain in Ann. Roy. Bot. Garden, Calcutta, iii ined.

EASTERN HIMALAYA: Chumbi, 11-12,000 feet, at Za-ne-gang and Put-lo, (Dr. King's collectors !).

Roots fibrous slender, stems 4-7 cm., calyx 5 mm. 5-toothed upper tooth entire subulate the others lanceolate serrate, corolla pink or purple tube 14-17 mm., beak 8 mm., anterior filaments inserted at middle of tube posterior opposito top of ovary, stigma exserted, capsule 11 mm. $\frac{1}{2}$ exserted ovate lanceolate apex straight acute, seeds 1.25 mm. few ovate dark minutely reticulated.

In habit resembles *P. confertiflora* but with a much longer tube and with altogether different capsule and seeds that ally it to *P. flexuosa*.

13. (—). *P. TENUICAULIS* Prain.

Stems slender decumbent or ascending, leaves long petioled 2-pinnatisect ultimate segments pinnatipartite radical caespitose cauline 1-2-paired opposito, bracts foliar, flowers axillary opposito distinctly pedicelled lower remote upper subcapitate, calyx campanulate slightly cleft, corolla tube slightly exceeding calyx, lip 3-fid lobes rotund lateral $\frac{1}{2}$ exceeding central, galea angularly curved beak straight apex acute entire, stamens inserted in middle of tube anterior filaments hirsute. *P. tenuicaulis* Prain in Ann. Roy. Bot. Garden, Calcutta, iii ined.

EASTERN HIMALAYA: Chumbi, 11,000 feet, at Pan-ka-be-see-mo and Tan-ka-la, (Dr. King's collectors!); E. Nepal, at Poy-kiong-la, (Mr. Pantling's collectors!).

Stems short 8-12 cm. or elongate 20-25 cm. branching from base, calyx 6 mm. 5-toothed teeth entire upper lanceolate acute the others ovate obtuse, corolla pink tube 8 mm., beak 10 mm., ovary ovate lanceolate, stigma exserted, capsule 12 mm. narrowly lanceolate $\frac{1}{2}$ exserted, seeds 2 mm. acutely ovate minutely reticulated.

Like a slender glabrous form of *P. flexuosa* from which, however, it is easily distinguished by the nonserrate calyx teeth, the entire apex of beak, and the much shorter corolla tube.

14. (—). *P. GAMMIEANA* Prain.

Stems sparingly branched from base villo-pubescent, cauline leaves 2-3 pairs small shortly petioled ovate oblong obtuse 2-pinnate, bracts sessile pinnatipartite, flowers few subcapitate, calyx campanulate shortly pedicelled, corolla tube more than twice as long as calyx, lip 3-lobed lobes depressed rounded lateral twice as large as central, galea arcuate beak straight short deeply emarginate, stamens inserted in middle of tube anterior filaments bearded above. *P. Gammieana* Prain in Ann. Roy. Bot. Garden, Calcutta, iii ined.

EASTERN HIMALAYA: Lang-mang-nang-zo, 10,000 feet, (Pantling!).

Stems in the solitary Calcutta gathering 6-8 cm., roots simple fibrous slender, radical leaves 0 cauline very small 5-8 mm. by 2-4 mm., calyx 7 mm. deeply 5-toothed upper tooth lanceolate entire smaller than the others with narrow entire bases and expanded elliptic acutely serrate tips, corolla purple tube 16 mm., beak 4 mm., ovary ovoid apex acute, stigma exserted.

The corolla differs from that of *P. binaria* Maxim. only in having the lower lip ciliate and the central lobe of lip less depressed but the habit of this Himalayan plant is quite unlike that of Maximowicz' Szetschuan plant.

15. (—). *P. SCHIZORRHYNCHA* Prain.

Dwarf stems tufted slightly pubescent, leaves long petioled oblong lanceolate acute pinnatipartite segments lanceolate serrate-dentate radical densely caespitose cauline opposite 1-paired or 0, bracts foliar petioled, flowers few subcapitate pedicels short, calyx tubular slightly cleft nerves pubescent, corolla tube slightly exceeding calyx, lip 3-partite margin ciliate lobes subobovate lateral slightly larger than central, galea arcuate subinflated beak short straight apex truncate bifid segments lacinate, stamens inserted above middle of tube anterior filaments densely hirsute. *P. schizorrhyncha* Prain in Ann. Roy. Bot. Garden, Calcutta, iii ined.

EASTERN HIMALAYA: Chumbi, (Dr. King's collectors!); Sikkim, (Jaffrey!); E. Nepal, (Mr. Pantling's collectors!).

Stems simple slender 4-6 cm. erect, roots fibrous tufted rootstock crowned with narrow scales, calyx 9 mm. 5-toothed teeth triangular subequal margins serrulate, corolla purple tube 10-12 mm., beak 4 mm. lateral segments each 3-fid, ovary ovoid, stigma exserted, capsule 10 mm. ovate apiculate slightly exserted, seeds ovoid trigonous grey distinctly reticulated.

16. (9). *P. INTEGRIFOLIA* Hook. f.; Maxim., Mel. Biol. xii, t. 2, f. 23.

* * *Upper lip shortly or not beaked.*

17. (—). *P. ALASCHANICA* Maxim.

Stems stout branching from the base villous ascending, leaves 2-4-nately whorled petioled pinnatifid segments lanceolate decurrent serrate, lower bracts foliar upper with bases entire membranous tips foliaceous pinnatilobed or serrate, flowers sessile in interrupted spikes, calyx membranous inflated ovoid, corolla tube hardly as long as calyx, lip 3-fid lobes rotund lateral thrice as wide as central, galea inflated angularly curved beak conical apex truncate entire, stamens inserted opposite top of ovary anterior filaments bearded.

VAR. *typica*; whorls 4-leaved, calyx nerves and margin villous teeth serrate except upper, beak as long as galea. *P. alaschanica* Maxim., Mel. Biol. x, 91 and xii, 860, t. 5, f. 86, a.

EASTERN HIMALAYA: Chumbi and Phari, (Dr. King's collector!).

VAR. *tibetica*; stems short, leaves opposite, calyx densely pubescent teeth entire, beak distinctly shorter than galea. *P. alaschanica* VAR. *tibetica* Maxim., Mel. Biol. xii, 860, t. 5, f. 86, b.

EASTERN HIMALAYA: Phari, (Dr. King's collector!).

Stems of *type* 15-20 cm., of VAR. *tibetica* 5-8 cm., calyx 12 mm. 5-toothed teeth triangular subequal, corolla yellow tube 11 mm., beak in *type* 2-2.25 mm. in VAR. *tibetica* 1-1.5 mm., ovary ovoid, stigma exserted, capsule ovoid 11 mm. not exserted, seeds large 3 mm. pale deeply furrowed and reticulated.

DISTRIB. S. Mongolia; W. China.

18. (9). *P. GLOBIFERA* Hook. f.; Maxim., Mel. Biol. xii, 869, t. 5, f. 95.

19. (10). *P. CHEILANTHIFOLIA* Schrenk; Maxim., Mel. Biol. xii, 869.

20. (11). *P. ROYLEI* Maxim., Mel. Biol. xi, 288 and xii, 891, t. 4, f. 122. *P. verticillata* Benth., DC. Prodr. x, 563 (pro parte nee Linn.); Hook. f., Flor. Brit. Ind. iv, 309. *P. amoena* Adam. VAR. —; Maxim. Mel. Biol. x, 97.

This Himalayan species repeats the habit and foliage of *P. verticillata* Linn., which is, however, distinct. The diagnosis is as follows:—

P. Roylei; bracts pinnatisect or -partite, calyx deeply toothed hardly cleft upper tooth entire the others serrate, corolla tube bent in the middle obtusely, filaments inserted near middle of tube all glabrous anthers ovate acute, capsule ovate acuminate $\frac{1}{2}$ exserted, seeds 1.25 mm. pale distinctly reticulated; *P. verticillata*; bracts ovate subentire, calyx hardly toothed cleft to the middle margin entire, corolla tube abruptly bent at junction of middle and lower third filaments inserted opposite top of ovary anterior pair hirsute anthers broadly elliptic muticous, capsule lanceolate acute more than $\frac{1}{2}$ exserted, seeds 2 mm. nigrescent minutely reticulated.

Reichenbach f., (*Icon. Fl. Germ.*, t. 1762, f. 1-14) unfortunately omits the always present hairs from the anterior stamens of *P. verticillata*. Lango (*Bot. Tidskr. Kjob. iv*, t. 2, f. 3) figures the seeds of *P. verticillata*, which differ markedly from those of *P. Roylei*, very exactly.

21. (—). *P. OPHIOCEPHALA* Maxim.

Stems sparsely hirsute erect or ascending simple few leaved, leaves pinnatipartito lanceolate segments oblong subacute incised serrate radical long petioled caespitose cauline short petioled 2-4-nately whorled, calyx campanulate hardly cleft, corolla tube obtusely bent in middle expanded upwards longer than calyx, lip 3-lobed lobes obcordate emarginate lateral $\frac{1}{2}$ exceeding central, galea slightly curved apex subacuminate, stamens inserted below middle of tube filaments glabrous. *P. ophiocephala* Maxim., *Mel. Biol.* xii, t. 5, f. 94.

NORTH-WEST HIMALAYA: Kamaon, 13-17,000 feet, Ralam Valley, Bidang and Lebang, (Duthie !); W. Nepal, Nampa Gadh, (Reid !).

Rootstock slender or stout crowned with scales, stems 6-15 cm., whorls 3-5-flowered usually approximate, calyx 9 mm. 5-toothed nerves pubescent upper tooth lanceolate or deltoid entire the others subequal serrate, corolla red tube 12 mm., staminal insertion a little above top of ovary, ovary ovoid disc anteriorly thickened, stigma exserted.

22. (12). *P. DENUDATA* Hook. f.; Maxim., *Mel. Biol.* xii, 867.

23. (35). *P. POLYGALOIDES* Hook. f.; Maxim., *Mel. Biol.* xii, 881, t. 5, f. 113.

This species, which has opposite leaves and repeats the habit and foliage of *P. instar* var. *paradoxa*, bears the same relationship to *P. denudata* which that variety bears to *P. instar* var. *typica*, except that the stamens of *P. polygaloides* are all glabrous those of *P. denudata* all hirsute.

24. (—). *P. GIBBERA* Prain.

Dwarf branched from the base stems prostrate 2-fariously hairy, leaves few radical evanescent cauline opposite distant ovate pinnatipartite segments pinnatifid petioles very long, bracts foliar, flowers

racemose distinctly pedicelled, calyx campanulate slightly cleft, corolla tube $\frac{1}{2}$ longer than calyx bent forward and expanded at top, lip 3-lobed lobes rounded emarginate equal, galea straight erect apex acuminate, stamens inserted in middle of tube anterior filaments hirsute. *P. gibbera* Prain in Ann. Roy. Bot. Garden, Calcutta, iii ined.

EASTERN HIMALAYA: East Nepal, 13-14,000 feet, at Tha-moo-tsa, Esan-an-gi, Pey-kiong-la and Bijan, (Dr. King's collectors!).

Annual, roots slender, stems 2-15 cm. simple or once branched, racemes few flowered pedicels as long as calyx, calyx 4.5 mm. 5-toothed with crisp white hairs on nerves upper tooth minute the rest lanceolate with obtuse serrate apices, corolla rose-pink or white tube 6 mm. expanded at top, galea twice as wide as tube, ovary lanceolate, stigma sub-included, capsule lanceolate acute 9 mm. $\frac{1}{2}$ exserted, seeds few (4-6) 3 mm. relatively very large black hardly pitted.

Closely related to *P. pygmaea* Maxim. This, however, differs as to bracts, in the corolla tube being bent at the top and not in the middle, in the galea being erostrate, and in the anterior filaments being hirsute. The lanceolate capsule, the very large hardly pitted dark seeds, and the leaves seem to indicate considerable affinity with *P. flexuosa* and its allies.

25. (13). *P. mollis* Wall.; Maxim., Mel. Biol. xii, t. 4, f. 126.

26. (—). *P. fragilis* Prain.

Stems simple elongated sparingly hairy, leaves 3-nately whorled sessile membranous elliptic acute pinnatifid segments lanceolate mucronate serrate, flowers axillary pedicels very short, calyx wide campanulate, corolla externally puberulous tube straight cylindric twice as long as calyx, lip sub-quadrato 2-plicate above anteriorly 3-lobed lateral lobes narrowly ovate acute half as wide as central obovate cucullate projecting, galea slightly dilated straight with very short wide truncate beak, stamens inserted near base of tube anterior filaments hirsute near apex. *P. fragilis* Prain; Maxim., Mel. Biol. xii, t. 5, f. 83. *Pedicularis*, sp. C. B. Clarke, Jour. Linn. Soc. xxv, 51.

ASSAM: Khasia Hills, 5-6000 feet, (Maun!); Barêl Mts, 6-8000 feet, (Prain!). N. Manipur, 6500 feet, (Clarke, n. 42041).

Stems 15-30 cm. lower third decumbent nodes aphyllous bulbiferous above rooting below upper two thirds erect leafy, roots slender disc-bearing, flowers in axils of 3-7 topmost whorls, calyx 5 mm. not cleft teeth 5 narrowly linear lanceolate equal upper entire the others subserrate, corolla green tube 9 mm., lip marginally ciliate, beak 1.5 mm., ovary ovate acuminate, stigma included, capsule 5 mm. subglobose acuminate not exserted, seeds small 1 mm. spherical pale with dark lateral raphe distinctly reticulated.

A very distinct species semi-saprophytic in humid shady forests of the Assam range, in which parasitism was carefully looked for but could not be detected. Attachment of roots to decaying vegetable matter was made out in the field in the specimens obtained in the Barél range.

27. (—). *P. KINGII* Prain.

Stems elongate very slender flexuose branching sparingly hairy, leaves opposite long petioled ovate pinnatisect segments subalternate 2-pinnatifid, flowers pedicelled racemose axillary, calyx campanulate deeply cleft, corolla straight tube wide cylindric twice as long as calyx, lip subquadrate 2-plicate above 3-lobed in front lateral lobes ovate acute half as wide as central rounded concave, galea slightly bent forward rounded in front apex cucullate, stamens inserted near base of tube anterior filaments distinctly bearded above. *P. Kingii* Prain; Maxim., Mel. Biol. xii, 895, t. 4, f. 127.

EASTERN HIMALAYA: Sikkim, at Gang-tuk, (Dr. King's collectors!).

Rhizome slender crowned with few stoloniferous scales, stolons very slender 5-15 cm. with scales at tips, leaf segments nearer stem distinctly petioluled, flowers in leaf axils towards points of stem and branches, calyx 4 mm. membranous cleft to base anteriorly teeth 5 small entire deltoid upper very minute, corolla tube 8.5 mm., anther lobes acutely tailed tips exserted, ovary ovate disc slightly thickened anteriorly, stigma subexserted; capsule not seen.

A very distinct and remarkable species.

28. (14). *P. PYCNANTHA* Boiss.; Hook. f., Flor. Brit. Ind. iv, 310 (syn. *P. Alberti* exclus.).

VAR. *typica*; bracts subentire, lip distinctly shorter than galea lobes rounded, stamens inserted just below middle of tube. *P. pycnantha* Boiss., Diagn., ser. i, xii, 45 and Flor. orient. iv, 484; Maxim., Mel. Biol. xi, 291 and xii, 895, t. 4, f. 127. *P. Olga* Regel, Acta Hort. Petrop. vi, 348 and Plant. Fedtsch., 61. *Pedicularis*, sp. Aitchison, Trans. Linn. Soc. n. s. iii, 9.

WESTERN HIMALAYA: Gilgit, 9-10,000 feet, (Giles!); Afghanistan, Kuram valley, (Aitchison!). DISTRIB.: Northern Persia, Western Turkestan.

VAR. *Semenowi*; bracts serrate, lip nearly equalling galea lobes shortly emarginate, stamens inserted opposite top of ovary. *P. Semenowi* Regel, Bull. Soc. Imp. Mosc. xli, 108 and Plant. Semenow., n. 810; Maxim., Mel. Biol. xi, 294 and xii, 894, t. 4, f. 129. *P. orthantha* Griseb. var. —; Maxim., Mel. Biol. x, 129.

WESTERN HIMALAYA: Rantak-chu, (Falconer!); Kunawar, (Royle!); Astor, 13,000 feet, (Tanner!); Lahul, (Hay! Stoliczka! Watt!); Pangl,

11—16,500 feet, and Upper Sntlej, 17000 feet, (Heyde !); Hazara, (Stewart); Gilgit, (Giles !). **DISTRIB.:** Eastern Turkestan, Altyn and Alatau Mts.

P. Alberti has alternate, not opposite, leaves; its stamens too are all glabrous while the anterior pair in this species have hirsute filaments: though the leaves of *P. Alberti* much resemble those of *P. pycnantha* its centrifugal inflorescence allies it more closely to *P. Oederi* which also has alternate leaves.

29. (—). *P. LYRATA* Prain.

Dwarf, simple or many headed, pubescent, leaves opposite subcordate ovate obtuse widely crenate denticulate petioled, bracts foliar, flowers subracemose shortly pedicelled, calyx tubular hirsute pubescent, corolla tube straight $\frac{1}{2}$ exceeding calyx, lip 3-lobed 2-plicate above lobes rotund eroso-crenulate subequal central emarginate, galea curved apex angularly cucullate prolonged shortly downwards then bifid with segments lacinate, stamens inserted near base of tube filaments glabrous. *P. lyrata* Prain; Maxim., Mel. Biol. xii, 890, t. 4, f. 135.

EASTERN HYMALAYA: Phari and Ting, (Dr. King's collector !).

Stems 3-6 cm., root slender branching, petioles of radical leaves as long as blade of cauline short, bracts sessile, calyx 8 mm. deeply 5-toothed hardly cleft upper tooth subulate the others with short narrow entire base and elliptic serrate-dentate lamina, corolla white tube 12 mm. slightly widened above glandular ciliate within, galea teeth 3-fid lowest segment subulate longer than the other two triangular, ovary lanceolate disc thickened in front, stigma included, capsule 14 mm. oblong-lanceolate acute nearly half exserted, seeds small 1.5 mm. ovoid rufous distinctly reticulated.

P. lutescens Franchet, to which this species is most nearly allied, differs by its shorter corolla tube, its 5-fid galea teeth, and its disc prolonged anteriorly into a spur.

30. (—). *P. COMPTONIAEFOLIA* Franchet.

Stems tall erect puberulous terete strict simple or sparingly branched above, leaves coriaceous shortly petioled 4-nately whorled linear oblong acuminate pinnatifid segments rounded margins cartilaginous minutely toothed, flowers short pedicelled numerous in interrupted spikes, bracts foliar mucronate-serrate longer than campanulate membranous calyx, corolla tube bent obtusely below middle expanded above three times as long as calyx, lip stipitate broadly ovate 2-plicate above shortly 3-fid lobes crenulate central rounded prominent smaller than ovate lateral, galea erect straight shortly beaked apex obliquely truncate with lateral subulate teeth below, stamens inserted opposite top of ovary filaments all pilose at insertion anterior pair hirsute above. *P. comptoniaefolia* Franchet; Maxim., Mel. Biol. xii, 871 t. 5, f. 96.

BURMA: Shan Hills, Fort Stedman, 6000 feet, (Collett!). *DISTRIB.*: Yunnan.

Stems 80-100 cm. thicker than crowquill, roots not seen, spikes 8-12 cm., calyx not cleft 6 mm. irregularly 5-toothed glabrous teeth deltoid unequal entire margins villous, corolla dark red tube 14-16 mm. obtusely bent at top of calyx internally glandularly hairy, ovary ovate, stigma exserted, capsule 7.5 mm. ovate acuminate slightly exserted, seeds 2.5 mm. testa rufous distinctly reticulated.

31. (—). *P. REX* Clarke.

Stems tall erect glabrous simple or sparingly fastigiately branching above strict 4-angled or slightly 4-winged, radical leaves evanescent cauline petioled 4-nately whorled whorls alternate lower petioles dilated at base upper winged connate in a campanulate perfoliate sheath laminae elliptic pinnatisect rhachis winged segments lanceolate acute pinnatifid, bracts foliar connate at bases in membranous tubes longer than calyx, flowers laxly interruptedly spiked, calyx subsessile thinly membranous deeply cleft and bifid, corolla tube straight 2-3 times as long as calyx, lip stipitate strongly 2-plicate 3-lobed lateral lobes subrotund half the size of central cucullate projecting elliptic broader than long, galea curved hardly beaked bidentate below apex, stamens inserted opposite top of ovary filaments rufous-villous above. *P. rex* Clarke; Maxim., Mel. Biol., xii. 875, t. 5, f. 103.

ASSAM: Khasia Hills, (Mann! Clarke). BURMA: (Brandis!). *DISTRIB.*: Yunnan; Kwei-tschou.

Stems 40-120 cm. roots fusiform, spikes 8-30 cm. in 4-flowered whorls 20-30 mm. apart, bract sheaths 10-12 mm. deep, calyx 10 mm. cleft to base below and $\frac{3}{4}$ - $\frac{1}{2}$ above segments deltoid entire or minutely 2 or 3-toothed at apex, corolla yellow tube 24-30 mm. 2-plicate like lip glandularly ciliate within, galea teeth long subulate, ovary ovate disc prolonged anteriorly as an erect conical spur equalling ovary, stigma included, capsule rhomboid hardly exserted from bract sheath, seeds 3 mm. elliptic black minutely reticulated.

Most nearly allied to *P. superba* Franchet, where also the flowers are sheathed by connivent bracts, but which has a very different calyx and corolla.

32. (—). *P. COLLATA* Prain.

Dwarf stems slender 2-fariously hairy single or tufted, leaves long-petioled radical caespitose cauline 1-pair opposite or 0 oblong acute pinnatifid segments ovate pinnatifid serrate, bracts foliar 2-pairs opposite, flowers 3 or 4, pedicelled, calyx oblong glabrous, corolla tube wide cylindric straight almost twice as long as calyx, lip 3-lobed 2-plicate lobes large rounded nearly equal, galea straight erect acuminate

2-dentate below apex, stamens inserted near base of tube anterior filaments bearded above. *P. collata* Prain in Ann. Roy. Bot. Garden, Calcutta, iii ined.

EASTERN HIMALAYA: Chumbi, at Cho-la, (Dr. King's collector !); Eastern Nepal, at Pey-kiong-la and Ny-e-gu, 11-13000 feet, (Mr. Pantling's collectors !).

Stems 1-4 cm., rootstock slender crowned with scales roots tufted fibrous, flowers opposite in both pairs of bracts, or in lower pair only with single terminal flower, calyx 10 mm. 5-toothed upper tooth entire subulate the others ovate obtuse serrate with short narrow entire bases, corolla pink tube 18 mm. dilated above externally lineate-pilose within glandularly hairy, ovary ovate lanceolate disc anteriorly thickened, stigma exserted; capsule not seen.

A very distinct dwarf species with large handsome flowers. The habit repeats that of dwarf forms of *P. Roylei*.

SERIES II. Cauline leaves alternate.

* *Upper lip beaked.*

33. (15). *P. TRICHOGLOSSA* Hook. f.; Maxim., Mel. Biol. xii, 842, t. 3, f. 63.
34. (16). *P. CLARKEI* Hook. f.; Maxim., Mel. Biol. xii, 840, t. 3, f. 60.
35. (17). *P. LACHNOGLOSSA* Hook. f.; Maxim., Mel. Biol. xii, 837, t. 3, f. 55.
36. (18). *P. EXCELSA* Hook. f.; Maxim., Mel. Biol. xii, 828, t. 3, f. 44.
37. (19). *P. MACRANTHA* Klotzsch.

VAR. *typica*; leaves pinnatipartite, flowers rosy red, beak conical gradually narrowing, central lobe of lip as long as lateral lobes. *P. macrantha* Klotzsch in Reis. Pr. Wald., Bot., 108, t. 59; Hook. f., Flor. Brit. Ind., iv, 311.

WESTERN HIMALAYA: Garhwal, (Strachey and Winterbottom,); Kamaon, (Duthie, n. 3216 !); Kunawar, (Hoffmeister !).

VAR. *lutescens*; leaves pinnatisect, corolla tube and lip yellow galea and beak dark purple, galea slightly crested beak slender narrow from the base, central lobe of lip shorter than lateral. *P. ochroleuca* Duthie; Maxim., Mel. Biol. xii, 790, t. 1, f. 5, (not of Schlosser!).

WESTERN HIMALAYA: Kamaon, 14-15000 feet, in Nipschang Valley; West Nepal, at Nampa Gadh, (Duthie nn. 3219! 5848!).

38. (—). *P. GARCKEANA* Prain.

Slender hirsute stems erect leafy, leaves petioled linear lanceolate pinnatifid segments mucronate dentate, flowers numerous axillary race-

mose long pedicelled, calyx cylindric hirsute distinctly cleft, corolla tube twice exceeding calyx, lip deeply trifid lateral lobes ovate central cuneate truncate projecting, galea falcate not inflated beak slender circinnate apex bifid, stamens inserted below apex of tube filaments hirsute anterior densely posterior sparingly. *P. Garckeana* Prain; Maxim., Mel. Biol. xii, 788.

EASTERN HIMALAYA: Chumbi, Phari, and Jongri, (Dr. King's collectors!).

Stems 5-15 cm. rootstock stout cylindric horizontal branching, pedicels longer than calyx lower pedicels elongating in fruit slender rigid erect 2-3 times as long as capsule, calyx 12 mm. distinctly reticulate-veined within 5-toothed teeth subequal elliptic serrate cristate, corolla dark red tube 22-30 mm. externally pubescent, beak 8 mm. as long as galea tips of apex segments acute, ovary ovate, stigma exserted, capsule ovate acuminate 18 mm. $\frac{1}{2}$ exserted, seeds 2 mm. rufous ovate subacute above distinctly reticulated.

39. (20). *P. ELWESI* Hook. f.; Maxim., Mel. Biol. xii, 793, t. 1, f. 8.

Add to description of F. B. I. iv, 312:—capsule 15 mm. ovate acuminate $\frac{1}{2}$ exserted, seeds 2.5 mm. ovate pale distinctly reticulated appressed below, with dark furrow on one side.

40. (2). *P. ROBUSTA* Hook. f.

41. (—). *P. NEPALENSIS* Prain.

Dwarf glabrous tufted almost stemless, leaves mostly radical all long petioled linear lanceolate pinnatifid segments ovate mucronate-dentate, flowers few (3-5) long pedicelled axillary calyx cylindric with nerves sparingly haired cleft $\frac{1}{2}$ anteriorly, corolla tube twice as long as calyx, lip 3-lobed margin crenulate lobes truncate lateral ovate twice as large as central rounded, galea inflated reflexed at base then subfalcate with short vertical bifid beak, stamens inserted above middle of tube all filaments hirsute. *P. nepalensis* Prain in Ann. Roy. Bot. Garden, Calcutta, iii ined.

EASTERN HIMALAYA: E. Nepal, at Ka-gling, 13000 feet, (Dr. King's collector!).

Stems 0-1 cm. rhizome short roots tufted fleshy, pedicels 25-35 mm., calyx 15 mm. 5-toothed teeth elliptic serrate upper narrower others subequal, corolla purple tube 25-28 mm. beak 4.5 mm., ovary lanceolate stigma included capsule oblong oblique 20 mm. $\frac{1}{3}$ exserted, seeds 2 mm. pale broadly ovate reticulations distinct but shallow.

42. (—). *P. SCULLYANA* Prain.

Stems hirsute erect strict stout simple leafy, leaves petioled lanceolate acute pinnatifid rhachis dentate segments oblong lanceolate

pinnatifid serrate dentate, flowers pedicelled axillary in dense racemes, calyx subglobose inflated hirsute corolla tube hardly as long as calyx, lip 3-lobed lateral lobes ovate twice as large as central orbicular, galea much inflated abruptly bent beak half as long as galea directed downwards deeply bifid, stamens inserted in middle of tube filaments hirsute. *P. Scullyana* Prain; Maxim., Mel. Biol. xii, 789, t. 1, f. 6.

CENTRAL AND EASTERN HIMALAYA:—Nepal, (Wallich! Scully!); Jongri, (Dr. King's collectors!).

Stems 24-50 cm. as thick as little finger, rootstock horizontal thick fleshy, leaves with white crisp hairs, pedicels shorter than calyx, calyx 20 mm. 5-toothed teeth equal ovate lanceolate deeply serrate, corolla yellow tube 18 mm. expanded above externally pilose, beak 4 mm. segments acute, ovary lanceolate stigma exserted, capsule ovate acuminate 23 mm. $\frac{1}{2}$ exserted, seeds 3 mm. pale appendaged below, reticulations small but deep.

43. (21). *P. MEGALANTHA* Don.

VAR. *typica*; flowers numerous densely racemose, corolla tube 2-3 times as long as calyx, lateral lobes of lip twice as wide as irregularly triangular central. *P. megalantha* Don. Prodr. Flor. Nepal. 94; Wall., Cat. 411; Benth., DC. Prodr. x, 564; Regel, Gartenflora, t. 943; Hook. f., Flor. Brit. Ind. iv, 312. *P. Hoffmeisteri* Klotzsch, Reis. Pr. Wald., Bot., 108, t. 60.

ALPINE HIMALAYA; Kashmir to Chumbi and Bhutan.

VAR. *pauciflora*; flowers few (3-6) axillary; corolla tube 4-5 times as long as calyx, lateral lobes of lip deeply emarginate 4-5 times as wide as subglobose central. *P. megalantha* VAR. *pauciflora* Prain; Maxim., Mel. Biol. xii, 793.

EASTERN HIMALAYA: Chumbi and Jongri, (Dr. King's collectors!).

Corolla tube, of type 50-55 mm., of VAR. *pauciflora* 80 mm. Flowers in West Himalaya golden-yellow, in Nepal pink galea with yellow tube and lip, in Sikkim and Bhutan rose-purple, in S. Tibet dark purple.

44. (22). *P. BICORNUTA* Klotzsch.

45. [26]. *P. ELEPHANTOIDES* Benth.

Stems pubescent simple stout erect leafy, leaves petioled linear oblong pinnatifid segments obtuse crenate, flowers numerous crowded racemose pedicelled, calyx inflated glabrous, corolla tube hardly exceeding calyx, lip deeply 3-lobed lateral lobes ovate $\frac{1}{2}$ wider than central oblong, galea slightly inflated beak narrow very long slender flexuous apex reflexed obtuse entire, stamens inserted near apex of tube filaments glabrous. *P. elephantoides* Benth., Scroph. Ind. 53, and DC. Prodr. x, 564; Maxim., Mel. Biol. xii, t. 1, f. 4.

WESTERN HIMALAYA :—Kashmir, (Royle, Sedgwick !).

Stems as thick as goose quill, pedicels half as long as calyx, calyx 15 mm. 5-toothed slightly cleft teeth ovate serrate upper $\frac{1}{2}$ the size of others densely reticulate between the nerves, corolla yellow or with galea and beak purple, tube 15 mm., beak 24 mm. margins of filaments undulate, ovary lanceolate acute, stigma exserted, capsule not seen.

Repeats habit and foliage, calyx, corolla tube and lip of *P. bicornuta* from which, however, it differs in the throat not being contorted and in the beak, which is nearly twice as long and is quite entire at apex. Apparently uncommon and not reported either at Calcutta or Saharanpur since collected by Dr. Royle till communicated by Major Sedgwick, R. E. in 1885. In Sedgwick's plant the hood and beak are dark purple the tube and lower lip golden yellow.

46. (23). *P. BELLA* Hook. f.; Maxim., Mel. Biol. xii. t. 1, f. 3.

47. (—). *P. PRZEWALSKII* Maxim.

Dwarf almost stemless, radical leaves tufted narrowly oblong imbricate-crenate densely pubescent, flowers few axillary pubescent, calyx cylindric slightly cleft, corolla tube almost thrice as long as calyx, lip deeply 3-lobed lobes rounded subequal, galea erect slightly inflated beak straight bifid halfway, stamens inserted near top of tube filaments all hirsute. *P. Przewalskii* Maxim., Mel. Biol. x, 84, and xii, 787, t. 1, f. 2.

EASTERN HIMALAYA :—Phari, (Dr. King's collector!). DISTRIB : N. Tibet; China, Kausu and Szetschuan.

Rootstock fusiform somewhat slender, calyx densely hirsute 11 mm. 5-toothed upper tooth entire very small the others crested anterior pair smaller than lateral, corolla rose-pink tube 30 mm. puberulous externally, beak 7 mm. segments slightly expanded at tips, ovary oblong, stigma subincluded, capsule oblong oblique shortly cuspidate.

48. (—). *P. DALTONI* Prain.

Densely pubescent stems short erect, leaves petioled linear pinnatifid segments ovate mucronate-dentate flowers axillary pedicels very long, calyx cylindric $\frac{1}{2}$ cleft anteriorly densely hirsute, corolla tube $\frac{1}{2}$ exceeding calyx lip 3-fid margin crenulate lobes rounded lateral $\frac{1}{2}$ larger than central, galea inflated slightly reflexed then arcuately curved beak straight $\frac{1}{2}$ bifid stamens inserted above middle of tube filaments all hirsute. *P. Daltoni* Prain in Ann. Roy. Bot. Garden, Calcutta, iii ined. *P. asplenifolia* var. *pubescens* Hook. f., Flor. Brit. Ind. iv, 315. *Pedicularis* n. 20, Herb. Ind. Or. H. f. and T. T.

EASTERN HIMALAYA : Sikkim, Donkia-la, (Hooker! Dr. King's Collector!), and Ze-lep-la, (Dr. King's Collector!); Chumbi, Perm-la and Chum-la-ree, (Dr. King's Collectors!); Phari, (Dr. King's Collector!).

Stems 2-6 cm. high, 2-20 from stout branching rhizome, petioles slightly dilated at base, pedicels 25-60 mm. rigid elongating in fruit, calyx 10-12 mm. 5-toothed segments elliptic serrate upper smallest, corolla red tube 16 mm. distinctly widened at apex nearly glabrous externally, beak 5 mm. segments with acute tips, capsule oblong oblique shortly cuspidate nearly $\frac{1}{2}$ exserted, seeds ovoid pale distinctly reticulated.

49. (24). *P. SIPHONANTHA* Don; Hook. f.

VAR. *typica*; leaf segments lanceolate, corolla tube 4-5 times as long as calyx, throat acutely bidentate. *P. siphonantha* Don, Prodr. Flor. Nepal., 95; Wall., Cat. 417; Benth., DC. Prodr. x, 565. *P. Hookeriana* Wall., Cat., 421; Benth., Scroph. Ind. 53, and DC. Prodr. x, 564. *P. himalayca* Klotzsch, Reis. Pr. Wald., Bot., 107, t. 58.

In two very distinct forms:—*a*. “*siphonantha vera*”, with short decumbent stems or stemless, leaf segments contiguous = *P. siphonantha* Don; Wall.; Benth. ll. cc., the more usual form in Sikkim and Nepal, comparatively unusual in Kamaon and not apparently occurring in Kashmir or W. Tibet; and *β*. “*Hookeriana*”, with long ascending or erect stems, leaf segments distant subalternate = *P. Hookeriana* Wall.; Benth. ll. cc. and = *P. himalayca* Klotzsch l. c., the form characteristic of Kashmir and W. Tibet but occasionally reported from Sikkim also. There are, however, forms intermediate in habit and as the floral structure is identical they cannot be looked upon as distinct varieties.

VAR. *brevituba*; leaf segments ovate, corolla tube 2-3 times as long as calyx, teeth of throat obtuse or almost absent. *P. Elephas* Boiss., Diag., Ser. i; iv, 81, and Flor. orient., iv, 489; Benth., DC. Prodr. x, 565. *P. punctata* Dene, Jacquem. Voy., Bot., 111, t. 122; Benth., DC. Prodr. x, 565.

Also in two very distinct forms:—*γ*. “*Elephas*”, with short stems and contiguous imbricate leaf-segments = *P. Elephas* Boiss. ll. cc. as to description but excluding “Griffith 1060” which has apex of beak entire and is, as Sir J. D. Hooker points out, *P. rhinanthoides*:—and *δ*. “*punctata*” with tall rigid erect stems and distant alternate leaf-segments = *P. punctata* Dene; Benth. ll. cc., frequently distributed with specimens of form *β*. as “*P. Hookeriana*.” Specimens intermediate as to foliar characters certainly occur but “*punctata*” differs from Wall. Cat. 421 by its shorter tube, indistinct teeth, and very large lower lip the lateral lobes of which embrace the throat and meet behind the galea; these characters though constant are not however of specific value.

The forms of VAR. *typica* repeat the habit and foliage of the two forms of *P. longiflora*, those of VAR. *brevituba* repeat the habit and foliage of the two varieties of *P. rhinanthoides*.

P. labellata Jacquem. is excluded from *P. siphonantha* by its entire apex of beak, its edentulous throat, its inflated galea and its 5-toothed calyx, while *P. Hoffmeisteri* Klotzsch, an original specimen of which Dr. Gareke of Berlin has kindly sent to the Calcutta herbarium, is *P. megalantha* Don, var. *typica*.

50. (27). *P. LONGIFLORA* Rudolph, Mem. Acad. St. Petersburg, iv, 345, t. 3, (1811); Bunge, Ledeb. Flor. Ross. iii, 276; Maxim., Mel. Biol. x, 86. *P. tubiflora* Fischer, Mem. Soc. Mosc., iii, 53, (1812); Steven, Monogr. Pedic., 30; Benth., DC. Prodr. x, 565; Hook. f., Flor. Brit. Ind. iv, 314. *P. tubiformis* Klotzsch, Reis. Pr. Wald., Bot. 106, t. 57.

51. (26.) *P. RHINANTHOIDES* Schrenk.

Var. *typica*; stems short 5-10 cm., beak 6 mm. as long as galea shorter than lip, anterior stamens sparingly hirsute. *P. rhinanthoides* Schrenk, Enum. Pl. Nov., i, 22; Benth., DC. Prodr. x, 565; Bunge, Ledeb. Flor. Ross. iii, 276.

Not in India. DISTRIB: Alatau, (Schrenk); Hindoo Koosh, (Griffith 1060!); Turkestan, Ishomori, (A. Regel!).

A gathering from Tehri-Garhwal with short stems 3 cm. high, (Duthie 576!), has the short beak of var. *typica* with the stout stems and densely hairy anterior stamens of the following variety which it thus connects with the typical plant.

Var. *labellata*; stems stouter 8-40 cm., beak 10-14 mm. longer than galea and equalling or exceeding lip, anterior stamens densely hirsute. *P. labellata* Jacquem., Dene, Jacquem. Voy., Bot., 117, t. 123; Benth., DC. Prodr. x, 565; Maxim., Mel. Biol. x, 83, and xii, 792. *P. rhinanthoides* Hook. f., Flor. Brit. Ind. iv, 313, excluding synonyms.

52. (—). *P. GRUINA* Franchet.

Branching from base central stem erect others decumbent stems hirsute leafy, leaves very small short-petioled pinnatifid segments distant oblong recurved margins cartilaginous serrate, flowers axillary racemose distant long pedicelled, calyx hirsute campanulate, corolla tube slightly exceeding calyx, lip broader than long 3-lobed lateral lobes rhomboid 4 times as large as central orbicular, galea inflated bidentate beak long slender apex decurved acute entire, stamens inserted above middle of tube filaments hirsute. *P. gruina* Franchet; Maxim., Mel. Biol. xii, 799, t. 1, f. 15.

BURMA-YUNNAN FRONTIER: Momyen, (Anderson!). DISTRIB: Yunnan.

Roots slender fibrous, central stem 8-10 cm. sparingly shortly branched, decumbent stems simple rooting below, pedicels longer than calyx, calyx 6 mm. 5-toothed teeth equal ovate acute with narrow entire bases and deeply retroserrate margins above, corolla red tube 7.5 mm., beak 10 mm., ovary oblong lanceolate, stigma hardly exserted.

Momyen, the locality of the single Calcutta gathering, is just within the Yunnan frontier, technically therefore this species does not deserve a place in the Indian Flora; as, however, when Upper Burma becomes botanically better known this is likely to be met with the diagnosis is given here.

53. (25). *P. CARNOSA* Wall.; Maxim., Mel. Biol. xii, t. 3, f. 52.

54. (28). *P. MICROCALYX* Hook. f.; Maxim., Mel. Biol. xii, t. 52, t. 4, f. 71.

55. [29]. *P. ALBIFLORA* Prain.

Dwarf tufted glabrous stems short or 0, cauline leaves 0 radical numerous caespitose long petioled oblong-lanceolate pinnatisect segments distant ovate mucronate-dentate, flowers few shortly pedicelled subcapitate or the lower scattered lower alternate upper subopposite, calyx cylindric-campanulate hardly cleft, corolla tube twice as long as calyx lip 3-lobed lobes rounded lateral $\frac{1}{2}$ exceeding central galea arcuately curved beak conical falcate apex obtuse crenulate not bifid, stamens inserted in middle of tube filaments glabrous. *P. albiflora* Prain in Ann. Roy. Bot. Garden, Calcutta, iii ined. *P. asplenifolia* var. *albiflora* Hook. f., Flor. Brit. Ind. iv, 315.

EASTERN HIMALAYA; Sikkim, (Hooker, Dr. King's Collectors !).

Stem 0-8 cm., rootstock slender with few ovate scales, bracts $\frac{1}{2}$ longer than calyx 3-sect dilated at base, calyx 8-10 mm. 5-toothed teeth lanceolate entire obtuse except upper smallest acute, corolla white tube 20-24 mm. uniform throughout beak 3-5 mm., ovary lanceolate stigma subexserted; capsule not seen.

56. (29). *P. WALLICHII* Bunge, Bull. Sc. Acad. St. Petersb. viii, 251, (name only), and Walp. Rep. iii, 415. *P. asplenifolia*, Wall., Cat. 416A, (not of Floerke and excluding specimen B). *P. asplenifolia*, Hook. f., Flor. Brit. Ind. iv, 315, (not of Floerke, and excluding varieties and synonyms).

This differs from *P. albiflora* in having both pairs of stamens hirsute, in its wide subinflated calyx, its numerous lanceolate rhizome scales and its few radical leaves. Wall. Cat. 416B is *P. Oederi* Vahl, var. *heteroglossa*.

57. (30). *P. FLAGELLARIS* Benth.; Hook. f.

58. (31). *P. FURFURACEA* Wall.; Maxim., Mel. Biol. xii, t. 3, f. 59.

59. [31]. *P. PANTLINGII* Prain.

Stems single or several from base unbranched rigid tall leafy 3-5-fariously hairy above, leaves long-petioled furfuraceous beneath broadly ovate pinnatilobed lobes ovate serrate, flowers axillary in dense racemes pedicelled, calyx campanulate hirsute, corolla tube widened above as long as calyx, lip 3-lobed margin ciliate lateral lobes ovate thrice as

large as central orbicular, galea inflated bent at a right angle beak straight apex bifid segments emarginate, stamens inserted opposite top of ovary anterior filaments puberulous. *P. Pantlingii* Prain in Ann. Roy. Bot. Garden, Calcutta, iii ined. *P. furfuracea* var. *integrifolia* Hook. f., Flor. Brit., Ind. iv, 316. *Pedicularis* n. 30, Herb. Ind. or H. f. and T. T.

EASTERN HIMALAYA: Sikkim, (Hooker, Pantling !); Chumbi, (Dr. King's collectors !).

Rootstock slender, stems as thick as goose quill strict 30-40 cm. calyx 8 mm. nerves densely pilose 5-toothed not cleft teeth large upper deltoid entire others ovate incised serrate, corolla red-purple tube 8 mm., beak 8 mm. inner lobe of apex segments larger, capsule 17 mm. broadly lanceolate acuminate $\frac{1}{2}$ exserted, seeds 2 mm. ovate acute black hardly reticulated.

Very similar and nearly allied to *P. furfuracea* Wall. but with less incised leaves and more rigid thicker stems. The diagnosis is as follows :—*P. furfuracea*; calyx glabrous $\frac{2}{3}$ cleft in front 5- or 3-toothed teeth minute, or margin not toothed, corolla pale pink or white tube somewhat longer than calyx, lobes of lip all truncate emarginate ciliate, galea glabrous throat 2-sinuate apex of beak deeply bifid segments emarginate outer lobes large ovate, filaments glabrous, capsule narrowly lanceolate acuminate $\frac{2}{3}$ exserted; *P. Pantlingii*; calyx hirsute not cleft 5-toothed teeth large, corolla dark-purple tube not exserted, lobes of lip rounded entire margin ciliate, galea furfuraceous throat entire apex of beak less deeply bifid segments emarginate outer lobes triangular minute, anterior filaments puberulous, capsule wide lanceolate acuminate $\frac{1}{2}$ exserted. The flower and fruit in *P. Pantlingii* are larger than in *P. furfuracea*, in which calyx is 6 mm., corolla 10 mm., capsule 14 mm.

60. (—). *P. REGELIANA* Prain.

Dwarf stemless, leaves pinnatisect segments ovate pinnatifid toothed, flowers axillary long pedicelled, calyx campanulate nerves hirsute, corolla tube $\frac{1}{2}$ longer than calyx expanded above, lip 3-fid lobes rounded lateral $\frac{1}{2}$ exceeding central, galea much inflated arcuate throat 2-dentate beak very short truncate apex entire, stamens inserted above middle of tube anterior filaments densely posterior sparingly hirsute. *P. Regeliana* Prain in Ann. Roy. Bot. Garden, Calcutta, iii ined.

EASTERN HIMALAYA: Phari and Jongri, (Dr. King's collectors !).

Roots slender fibrous, leaves long-petioled, pedicels stout 2-4 times as long as calyx, calyx 10 mm. 5-toothed $\frac{1}{2}$ cleft in front teeth serrate upper smallest lateral larger than anterior pair, corolla purple tube 15-18 mm., galea with teeth directed downwards and crested above as far as the origin of beak, beak 1.5 mm., ovary ovate, stigma exserted,

capsule 18 mm. narrowly ovate apex acuminate $\frac{1}{2}$ exserted, seeds few 2.5 mm. ash grey striate but hardly reticulated.

Repeats habit and foliage of *P. acaulis* Wulff. but is smaller in all its parts. The calyx teeth are smaller and the galea is widely different; the capsule on the other hand is larger.

61. (—). *P. ODONTOPHORA* Prain.

Stems short puberulous several from rootstock, leaves long petioled radical few finally evanescent cauline 1-2 alternate pinnatisect segments pinnatifid, flowers few axillary rather crowded shortly pedicelled, calyx campanulate, corolla tube twice as long as calyx slightly widened above, lip 3-lobed lobes ovate later $\frac{1}{2}$ exceeding central, galea 2-dentate slightly inflated widely arcuately curved beak straight apex emarginate, stamens inserted in middle of tube anterior filaments densely hirsute throughout posterior sparsely hirsute below glabrous above. *P. odontophora* Prain in Ann. Roy. Bot. Garden, Calcutta, iii ined.

EASTERN HIMALAYA :—Sikkim, Na-tong, (Dr. King's collectors!); Phari, Do-tho, (Dr. King's collector!).

Rootstock creeping with squamous nodes and crowned with scales, stems 2-4 cm. calyx 7 mm. 5-toothed teeth entire upper tooth and lower pair deltoid intervening subulate, corolla tube white 13 mm. with dorsal line of hairs outside extended along erect portion of galea which is bidentate anteriorly, inflated part of galea and beak pink, beak 5 mm., ovary ovoid, stigma exserted; capsule not seen.

A very distinct species.

62. (?32). *P. CURVIPES* Hook. f.; Maxim., Mel. Biol. xii, 919.

Not yet received in flower. Add to locality of F. B. I. iv, 316;—ASSAM : Naga Hills, 9000, (Clarke!).

63. (33). *P. DOLICHORRHIZA* Schrenk, Enum. Pl. Nov. ii, 23; Walp. Rep. iii, 426; Bunge, Ledeb. Flor. Ross. iii, 291; Benth., DC. Prodr. x, 570; Maxim., Mel. Biol. x, 117 and xii, 905, t. 6, f. 146. *P. cabulica* Benth., DC. Prodr. X, 575. *P. fissa* Turcz. ? Hook. f., Flor. Brit. Ind. iv, 316.

WESTERN HIMALAYA : Iskardo, (Dr. Falconer's collectors!); Ladak, (Henderson!); Gilgit, (Tanner!, Giles!); Hindu Koosh, (Griffith, [3941 Kew distribution]!, Giles!); Afghanistan, Kurzar, (Griffith, [1143 Journ.]!).

Gilgit and W. Tibet gatherings quite agree with specimens of *P. dolichorrhiza* received from St. Petersburg; it is not possible to separate *P. cabulica* from *P. dolichorrhiza* even as a variety.

* * Upper lip shortly or not beaked.

64. (34). *P. OEDERI* Vahl in Hornem., Oekon. Plantcl., ed. ii,

580, (1806) and ed. iii, 674; Hartm., Flor. Skand., 199; Carnel in Parlatores, Flor. Ital. vi, 429; Reichb. f., Flor. Germ. xx, 76, t. 1759, f. 2; Lange, Nomenclator Flor. Dan., 2; Trautv., Incrim. Flor. Ross. iii, 77. *P. versicolor* Wahlenberg, Veg. Helvet., 118, (1813) and Flor. Suec. i, 389; Hartm., Vet. Ak. Handl., 135; Steven, Monogr. Pedic., 52; Reichb., Iconog. i, 31, t. 14; Ledeb., Flor. Altaic. ii, 437; Turcz., Flor. Baic.-Dahur. iii, 375; Bunge in Ledeb. Flor. Ross. iii, 300; Walp., Rep. iii, 428; Royle, Illustr. t. 72, f. 2; Benth., DC. Prodr. x, 578; Maxim., Mel. Biol. x, 133 and xii, 918, t. 7, f. 177; Hook. f., Flor. Brit. Ind. iv, 346. *P. flammea* Oeder, Flor. Dan., t. 30, (1761); Allioni, Flor. Pedemon. i, 63; Haenke in Jacquin. Collectan. ii, 70; Poiret in Lamk, Eucyclop. v, 135; (not *P. flammea* Linn.). *P. flammea* var. *major* Wahlenberg, Flor. Lappon., 168, (1812). *P. hirsuta* Smith in Rees, Cyclop. vol. xxvi, (1819); (not *P. hirsuta* Linn.).

VAR. *typica*; galea wider and shorter than tube, central lobe of lip not projecting, calyx teeth triangular equal apices acuto.

WESTERN HIMALAYA:—Kashmir, (Royle!); Tibet, (Falconer!, Thomson!, Stoliczka!, Brandis!, Ellis!). DISTRIB: Arctic and Alpine Europe; Arctic and Alpine Siberia; Arctic America.

The Kashmir and Tibet plant is the same as the Dahurian form having the calyx hirsute and the teeth, except the upper, serrate; the lobes of the lip are entire as in the Scandinavian and Arctic form, (*P. Oederi* Vahl), where the calyx is also hirsute but all the calyx teeth are entire, and not emarginate as in the Swiss plant, (*P. versicolor* Wahlbg., Veg. Helvet. 118), where the calyx teeth are also entire the calyx being glabrous.

VAR. *heteroglossa*; galea narrower than in type and as long as tube, central lobe of lip projecting, calyx teeth narrowly lanceolate all, or upper excepted, with expanded orbicular serrate tips. "*An eadem ac P. asplenifolia?*" Wallich in sched., Wall Cat., 416 B.

WESTERN AND CENTRAL HIMALAYA:—Kamaon, (Royle!, Wallich!, Collett!, Duthie!, Reid!); Nepal, (Scully!). DISTRIB: N. Tibet, N. China, E. Kansu.

The Kamaon form is Wall. Cat. 416B which that author only doubtfully referred to his *P. asplenifolia*. It may be the plant intended by Royle, (Ill., t. 72, f. 2), since he there figures a plant with small lower lip, which is true of this, and since Kamaon specimens of this obtained by him are preserved at Saharanpur. But the lip of his figured plant is too small even for this form and he cites Kashmir in the text as its locality; his Kashmir specimens are true VAR. *typica* only. The various Kamaon gatherings exactly agree;—calyx hirsute upper tooth linear lanceolate acute, lip of corolla $\frac{1}{2}$ smaller than in VAR.

typica margin erenulate central lobe ovate lanceolate, galea $\frac{1}{2}$ longer than in *VAR. typica* as narrow as tube. Dr. Scully's Nepal gathering differs considerably;—calyx glabrescent all the teeth with ovate expanded tips, corolla lip 3 times as large as in *VAR. typica* margin entire lobes orbicular, galea narrower than tube. The greatest difference is in the much larger lip; perhaps *VAR. heteroglossa* should be considered a species distinct from *P. Oederi* with the Nepal plant as a definite variety of this new species.

65. (—). *P. PRAINIANA* Maxim.

Erect strict stout hirsute stem leafy simple, leaves oblong linear sessile deeply pinnatifid segments oblong acute deeply irregularly serrate, bracts linear oblong serrulate at apex, flowers densely spiked, calyx campanulate hirsute, corolla tube slightly exceeding calyx, lip 3-fid lobes obovate equal margins ciliate, galea sparsely hairy navicular beakless, stamens inserted in middle of tube filaments glabrous. *P. Prainiana* Maxim., Mel. Biol. xii, 844, t. 3, f. 66.

EASTERN HIMALAYA: Chumbi, at Lu-ma-poo, (Dr. King's collector!).

Stem 30-40 cm., upper bracts shorter than flowers, calyx 16 mm. 5-toothed upper tooth entire deltoid the others lanceolate serrate, corolla yellow tube 17 mm., galea rounded in front hiant, ovary ovoid, stigma erect; capsule not seen.

Repeats habit and foliage of *P. Clarkei*. Is nearly allied to *P. rudis* Maxim. and was originally distributed from Calcutta under that name; it is, however, as Mr. Maximowicz points out, perfectly distinct.

66. (26). *P. PERROTTEI* Benth.; Maxim., Mel. Biol. xii, t. 1, f. 1.

67. (—). *P. CORYMBOSA* Prain.

Stems stoutish short irregularly angular or flattened 2-3 furiously hairy branching, leaves petioled pubescent fleshy oblong acute narrowed at the base erenate lobes serrate, bracts sessile, flowers capitate and very shortly pedicelled at apices of stem and branches, calyx oblong pubescent fleshy, corolla tube twice as long as calyx slightly expanded above, lip 3-fid lobes oblong equal, galea hardly inflated widely arcuately curved and scarcely beaked, stamens inserted opposite top of ovary filaments glabrous. *P. corymbosa* Prain in Ann. Roy. Bot. Garden, Calcutta, iii ined.

BURMA: Shan Hills, Pwehla and Tamakan, 4000 feet, (Collett!); Maymyo Hill, 4000 feet, (Dr. King's collector!).

Stems 10-15 cm., branches axillary subcorymbose, roots fibrous, bracts wide-based serrate erenate $\frac{1}{2}$ longer than calyx, calyx 11 mm. deeply 2-fid, $\frac{1}{2}$ cleft in front teeth ovate crested tube densely pubescent externally and reticulated between the nerves within, corolla

tube white 18-24 mm., lip white with pink margin, galea rose-pink, ovary ovate lanceolate, stigma exserted.

Evidently nearly allied to *P. crenata* Maxim. which differs in having smaller flowers (22 mm. in place of 35-38 mm.), calyx not cleft both lobes 2-dentate and not reticulated internally, galea distinctly beaked, lip with ciliate margin, and anterior filaments bearded.

68. (—). *P. COLLETTII* Prain.

Very tall stems purpurascant pubescent terete rigid strict sparingly fastigiate branched towards apex, leaves and bracts coriaceous subscabrid ovate acute sessile crenulate serrate, flowers axillary sessile densely spiked, calyx coriaceous oblong densely pilose deeply 2-fid, corolla tube exceeding calyx expanded above glandular ciliate internally, lip widely stipitate 3-fid lobes orbicular equal, galea externally furfuraceous arcuately curved with short truncate beak emarginate at apex, stamens inserted near base of tube filaments rufous villous at insertion, glabrous above. *P. Collettii* Prain in Ann. Roy. Bot. Garden, Calcutta, iii ined.

BURMA: Shan hills, Koni, 4000 feet, and Toungyi, 5000 feet, (Collett!).

Stems 120 cm., rootstock stout horizontal, bracts longer than calyx, calyx 14 mm. $\frac{1}{2}$ cleft in front, $\frac{1}{3}$ behind, segments wide below, lanceolate above, tips obtuse entire, corolla purple tube 16 mm. ovary lanceolate acuminate, stigma exserted.

A very striking species with considerable affinity to *P. zeylanica* but with galea larger in proportion to tube and very different foliage and habit.

69. (37). *P. ZEYLANICA* Benth.; Maxim., Mel. Biol. xii, t. 3, f. 45.
INSUFFICIENTLY REPRESENTED.

70. (—). *PEDICULARIS* sp with alternate leaves.

MANIPUR: Sirohifur, (Watt!).

In leaf only; certainly not the same as any in the above list; seems a member of the section "*SIPHONANTHAE*," and is possibly conspecific with one or other of the Yunnan species of that section.

[Mr. Maximowicz in a letter received since the above was written says of this plant that it "looks like a *Siphonantha* or (less so) a *Comosa*." He does not recognise in it any of the Yunnan species (of which he has given full descriptions in Mel. Biol. xii); it should therefore be a species yet to be described.]